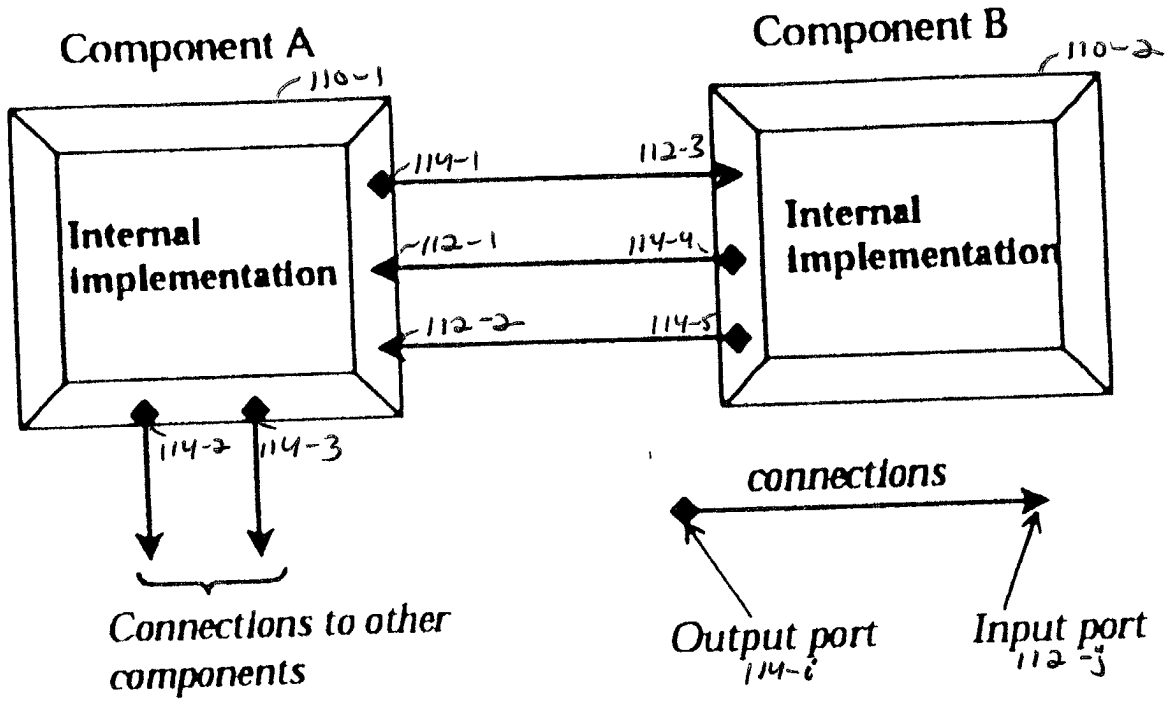

FIG. 1

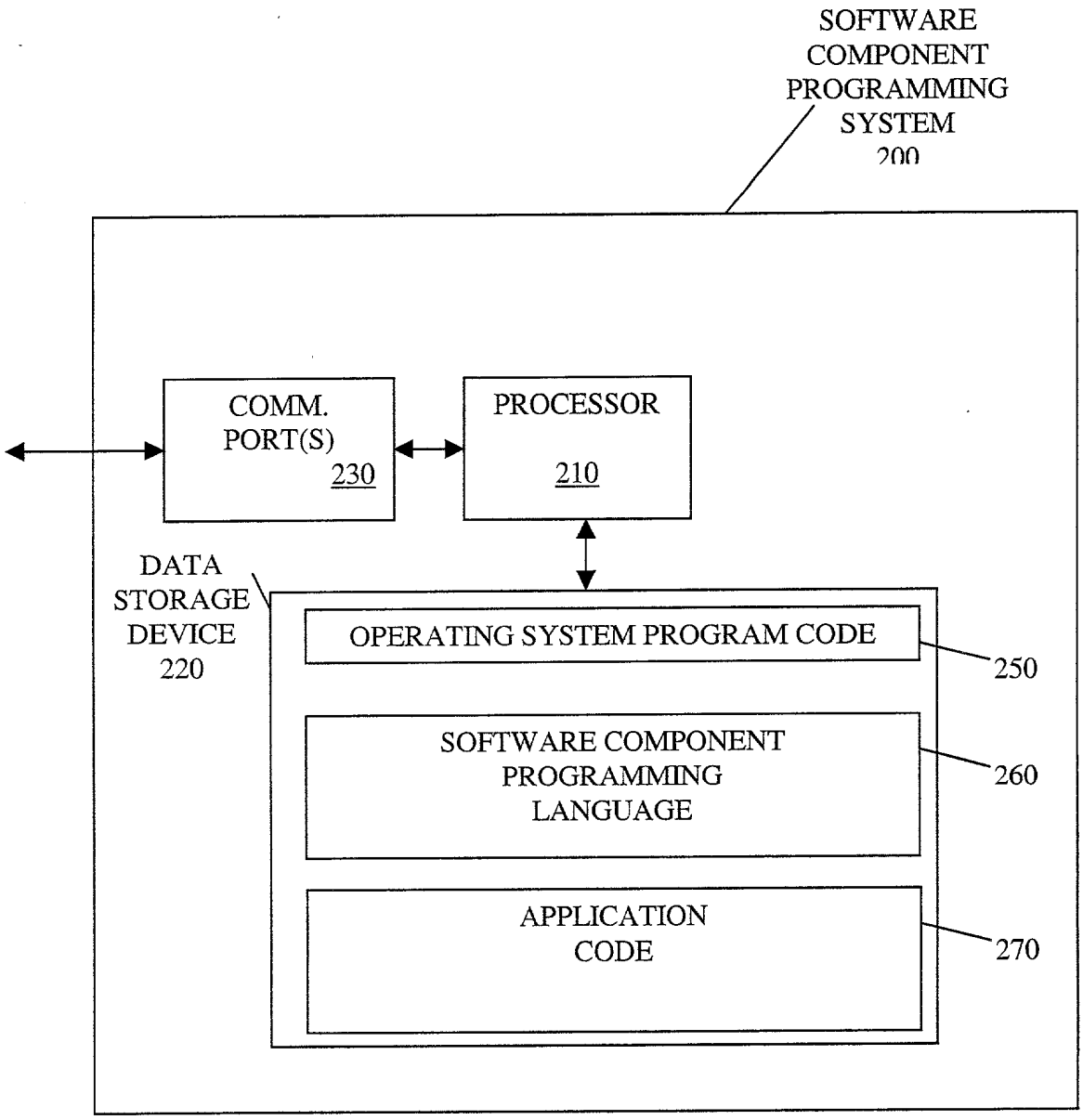
SOFTWARE
COMPONENT
PROGRAMMING
SYSTEM
200
COMM.
PORT(S)
230
PROCESSOR
210
DATA
STORAGE
DEVICE
220
OPERATING SYSTEM PROGRAM CODE
250
SOFTWARE COMPONENT
PROGRAMMING
LANGUAGE
260
APPLICATION
CODE
270

FIG. 2

P	::=	$defn^*\ e$
$defn$	::=	**interface** i **extends** $i^*\ \{MD^*\}$
		| **component** $\check{c}\ \{PD^*\ FD^*\ Con_{\check{c}}\ MD^*\ CD^*\}$
PD	::=	$p_i\ pd \mid p_o\ pd$
CD	::=	**class** c **implements** i^* **extends** $c\ \{FD^*\ Con_c\ MD^*\}$
FD	::=	$t\ f$
$Cons_{\check{c}}$	::=	$\check{c}([t\ var]^*\ \{\mathbf{This}.f^* = var^*;\ \mathbf{attach}\ pd^* : p_i^*\ \mathbf{to}\ c^*\ \}$
$Cons_c$	::=	$c([t\ var]^*\ \{\mathbf{This} : \check{c}.\mathbf{super}(var^*);\ \mathbf{this}.f^* = var^*\ \}$
MD	::=	$t\ m(\ [t\ var]^*\ )\ \{Body^*\}$
$Body$	::=	e | **abstract**
e	::=	var | **null** | **new** $z([t\ var]^*)$ | **view** $t\ e$
		| $\underline{\mathbf{This} : \check{c}}.f$ | $\underline{\mathbf{this} : c}.f$
		| $\underline{\mathbf{This} : \check{c}}.m(e^*)$ | $\underline{\mathbf{This} : \check{c}.\mathbf{this} : c}.m(e^*)$ | $\underline{\mathbf{This} : \check{c}.e : c}.m(e^*)$
		| $\underline{pd : p_o}.m\ (\ e^*\ )$ | **connect** $\underline{e : p_o}$ **to** $\underline{e : p_i}$
var	::=	variable name or **this** or **This**
pd	::=	port identifier
prm	::=	primitive types (`int`, `char`, etc.)
$\check{c}$	::=	component identifier
c	::=	class identifier
i	::=	interface identifier
f	::=	field identifier
m	::=	method identifier
p_i	::=	**in** i
p_o	::=	**out** i
z	::=	$c \mid \check{c}$
t	::=	$z \mid i \mid c \mid \mid p_i \mid p_o \mid prm;$

FIG. 3

ComponentOnce(P)	**component** $\check{c}\ldots$ **component** $\check{c}'\ldots$ is in $P \Rightarrow \check{c} \neq \check{c}'$
PortOnce($P, \check{c}$)	**component** $\check{c}\ \{\ldots\ p\ \ldots\ p'\ldots\}$ is in $P \Rightarrow p \neq p'$
InterfaceOnce(P)	**interface** $i\ldots$ **interface** $i'\ldots$ is in $P \Rightarrow i \neq i'$
ClassOnce($P, \check{c}$)	**component** $\check{c}\ \{\ldots$ **class** $c\ \ldots$ **class** $c'\ldots\}$ is in $P \Rightarrow c \neq c'$
MethodOnce($P, \check{c}$)	**component** $\check{c}\ \{\ldots\ m\ \ldots\ m'\ldots\}$ is in $P \Rightarrow m \neq m'$
MethodOnce(P, c)	**class** $\check{c}\ \{\ldots\ m\ \ldots\ m'\ldots\}$ is in $P \Rightarrow m \neq m'$
FieldOnce($P, \check{c}$)	**component** $\check{c}\ \{\ldots\ f\ \ldots\ f'\ldots\}$ is in $P \Rightarrow f \neq f'$
FieldOnce(P, c)	**class** $\check{c}\ \{\ldots\ f\ \ldots\ f'\ldots\}$ is in $P \Rightarrow f \neq f'$
InterfaceAbstract(P)	**interface**$\{\ldots m(\ldots)\{E\}\ldots\}$ is in $P \Rightarrow m$ is **abstract**
$\prec_P^{i,i'}$	$i \prec_P^{i,i'} i' \Leftrightarrow$ **interface** i **extends** i' is in P
$\prec_{P,\check{c}}^{c,c'}$	$i \prec_{P,\check{c}}^{c,c'} c' \Leftrightarrow$ **component** $\check{c}\ \{\ldots$ **class** c **extends** $c'\ \ldots\}$ is in P
$\prec_{P,\check{c}}^{c,i}$	$c \prec_{P,\check{c}}^{c,i} i \Leftrightarrow$ **component** $\check{c}\ \{\ldots$ **class** c **implements** $i\ \ldots\}$ is in P
$<:$	$<:$ is a reflexive, transitive closure of $\prec_P^{i,i'} \cup \prec_{P,\check{c}}^{c,i}$
WellFounded(P)	$<:$ is antisymmetric
ClassMethodOK(P, c	$<:$ Inheritance is consistent, method overriding preserves type, and classes implement all interface methods that its inherits.
InterfaceMethodOK(P)	$<:$ Inheritance or redeclaration of method are consistent, and methods cannot return or accept interface and class types (only component, port, and primitive types are allowed in methods declared in an interface)
NoAbstractMethod(P, $\check{c}$)	$<:$ Component have no abstract methods
NoAbstractMethod(P, c)	$<:$ Class have no abstract methods
PortsOK(P)	$<:$ Inheritance or redeclaration of ports are consistent
$\in_P^{i,m}$	Method m is declared in i $\langle s\ m(var_1 : s_1 \ldots var_n : s_n),\ E\rangle \Leftrightarrow$ **interface** $i\ \ldots\{s\ m(s_1\ var_1, \ldots, s_n\ var_n)\ \{E\}$ is in P
$\in_P^{\check{c},c}$	Class c is contained in a component $\check{c}$
$\in_P^{\check{c},m}$	Method m is contained in a component $\check{c}$
$\in_P^{\check{c},p}$	Port p is contained in a component $\check{c}$
$\in_P^{\check{c},f}$	Field f is contained in a component $\check{c}$
$\in_{P,\check{c}}^{c,m}$	Method m is contained (or inherited) in a class c that is defined in a component $\check{c}$
$\in_{P,\check{c}}^{c,f}$	Field f is contained (or inherited) in a class c that is defined in a component $\check{c}$
$\in$	$\in_P^{\check{c},c} \cup \in_P^{\check{c},m} \cup \in_P^{\check{c},p} \cup \in_P^{\check{c},f} \cup \in_{P,\check{c}}^{c,f}$
WellFormed(P)	P is well-formed if all of the above predicates and relations are satified.

FIG. 4